

BRIEF NOTE

The Occurrence of the Exotic *Daphnia lumholtzi* in Grand Lake St. Marys, Ohio¹

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ABSTRACT. An exotic *Daphnia*, *Daphnia lumholtzi* is reported from Grand Lake St. Marys, in west-central Ohio. This species was first reported in the USA in Texas, and 16 other primarily southern states. Its native habitat is east Africa, south-west Asia, and Australia. *D. lumholtzi* has appeared in zooplankton samples from Grand Lake St. Marys in the late summer and fall yearly since its first appearance in the fall of 1993.

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INTRODUCTION

The arrival of exotic species in US waters has attracted a great deal of attention recently. Much of this attention has been directed toward the zebra mussel *Dreissena polymorpha*, which may cause more than three billion dollars in damage nationwide (Lipinski 1994). Other invertebrate invaders include the bivalves *Corbicula fluminea* and *Potamocorbula amurensis*, and the cladocerans *Eubosmina coregoni* and *Bythotrephes cederstroemi* (Sprules et al. 1990). All of these invaders apparently arrived in ballast water of large ships. A great deal of money (about \$2.1 million in 1994 for zebra mussels) and research effort has been directed toward these organisms, primarily in the Laurentian Great Lakes. Much less attention has been paid to smaller bodies of water and less "dramatic" invaders. One such organism that has recently appeared in the US is the cladoceran *Daphnia lumholtzi* Sars 1885.

The presence of *Daphnia lumholtzi* in the US was first noticed in Fairfield Reservoir, Texas, in 1991 (Havel and Hebert 1993, Sorensen and Sterner 1992). It has since been reported in 16 states, primarily in the southern US but extending as far north as Kansas, Illinois, and the Ohio River (J. E. Havel pers. comm.). The natural distribution of *D. lumholtzi* is northern and eastern Australia, where it was first described; south-west Asia; and east Africa (Benzie 1988). This organism has also now been found in west-central Ohio.

Grand Lake St. Marys is a shallow impoundment in Auglaize and Mercer counties of west-central Ohio. It has a surface area of approximately 6,075 ha and a mean depth of 2.1 m. The lake was constructed in 1837-1845 as a water source for the Miami and Erie canal. It was, at the time, the largest man-made body of water in the world. In the 1890s, oil was discovered in the region and the lake was the site of offshore drilling. Grand Lake St. Marys became a state park in 1915. The southwest corner of the lake is the site of the Mercer County Wildlife Refuge. This lake is a major recreation area for fishing, boating, hunting, and camping.

MATERIALS AND METHODS

Depth integrated plankton samples were collected from the central region of Grand Lake St. Marys using a cone net (80 micrometer mesh) or a Clake-Bumpus quantitative sampler (153 micrometer mesh). Samples were examined live then preserved with 10% formalin. Sampling of the lake was performed monthly throughout the ice-free period of the year in conjunction with water quality sampling and the laboratory activities of biology classes.

RESULTS AND DISCUSSION

D. lumholtzi can be distinguished from native *Daphnia* species by several features (Fig. 1). Its helmet, although

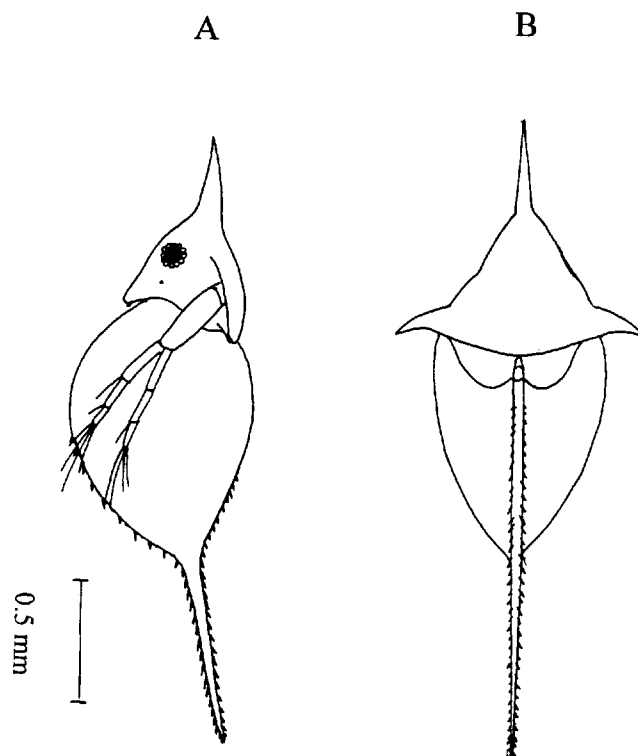


FIGURE 1. Morphological features useful in recognition of *Daphnia lumholtzi*. A-lateral view; B-dorsal view.

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similar to that of *Daphnia ambigua*, is larger. The spine, on top of the head, is large and often lanceolate. The cephalic fornices of *D. lumholtzi* are extended to a sharp point, rather than rounded, and the tail spine is normally as long as the body and is strongly spined. The carapace has approximately 10 prominent spines. The eye is not large, only about one quarter of the head depth. A conspicuous ocellus is present. Post abdomen of the female has three fleshy processes. The proximal process is larger than the medial or distal. Ten to fourteen anal spines are present. Terminal claws have three equal sized combs. The ephippium (Fig. 2) is also distinct from native species (Benzie 1988, Havel and Hebert 1993).

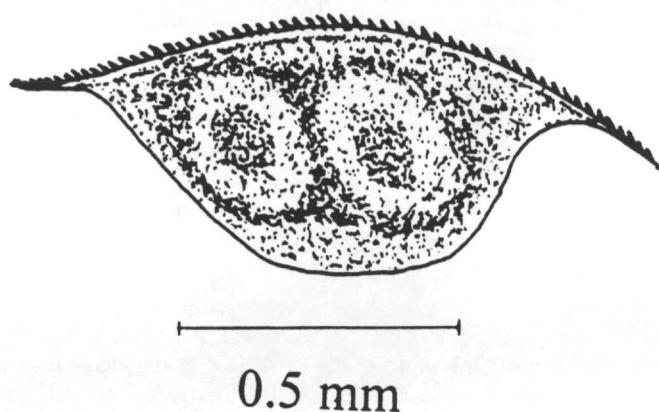


FIGURE 2. Ephippium of *Daphnia lumholtzi*.

D. lumholtzi were first noticed as an odd appearing *Daphnia* in field samples from Grand Lake St. Marys, Ohio, in the fall of 1993. They were the dominant large zooplankton in the lake at that time and persisted into November. These exotics were present again in September 1994 samples, at which time they were again the major *Daphnia* component of the zooplankton. The 1994 population, however, did not persist into the late fall, disappearing by mid-October. The 1995 appearance of *D. lumholtzi* was in October. They persisted until the end of November but their numbers were less than in the two preceding years. The large zooplankton of the lake were predominately *Diaptomus* spp. and *Cyclops* spp. copepods in both 1994 and 1995, which is the normal condition of Grand Lake St. Marys throughout the year.

How did *D. lumholtzi* get to the US and to Grand Lake St. Marys? Due to the distribution in North America of the organism it is unlikely that it reached our shores in ballast water. Allozyme comparison of North American and Australian *D. lumholtzi* by Havel and Hebert

(1993) indicate an African rather than Australian origin for the American population. Arrival in the US from Africa could have been by wind blown ephippia, which would seem unlikely, or via exotic fish. Nile perch from Lake Victoria were stocked in Lake Fairfield, Texas, in 1983 (Havel and Hebert 1993). *D. lumholtzi* most likely made its way to Grand Lake St. Marys through migratory waterfowl. Geese, ducks, gulls, and other waterfowl are abundant at the lake. Another possible source would be from recreational boating. The lake is a popular fishing site and has hosted regional and national fishing tournaments. It is conceivable that ephippia or live organisms traveled to Grand Lake St. Marys in the bilge, livewell, or engine cooling system of a bass boat.

At this time the presence of *D. lumholtzi* has not apparently had an adverse effect on the normal zooplankton composition. The lake's zooplankton is still predominately copepods and rotifers. Even when *D. lumholtzi* did make up the majority of large zooplankters in 1993, it maintained that position for only a short time.

Future research on *D. lumholtzi* in Grand Lake St. Marys will attempt to quantify the impact of this newcomer on the native species of *Daphnia* and its relationship to the lake's food chain. Another question to answer is the relationship of this population of *D. lumholtzi* to other populations now present in North America. This may help to establish the origin of the Grand Lake St. Marys' population. Finally there is the question of why *D. lumholtzi* appear in the fall. Is this a temperature effect, or the result of competition with other species?

The introduction of exotic species is a continuing world wide problem. Modern high speed transportation has increased the likelihood of these introductions, some of which have had devastating results on native species. While *Daphnia lumholtzi* has not had the kind of impact that zebra mussels have had, it still is a reminder of the problem. Not all invaders are easily noticed. What ultimate effect the accumulation of many of these less spectacular introductions will have on our aquatic ecosystems remains to be seen.

LITERATURE CITED

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